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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/756,122	01/13/2004	Wai-Fan Yau	AMAT/2592.C7/DSM/LOW K/JW	4554
44257	7590	07/29/2005	EXAMINER MALDONADO, JULIO J	
MOSER, PATTERSON & SHERIDAN, LLP APPLIED MATERIALS, INC. 3040 POST OAK BOULEVARD, SUITE 1500 HOUSTON, TX 77056			ART UNIT 2823	

DATE MAILED: 07/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/756,122

Applicant(s)

YAU ET AL.

Examiner

Julio J. Maldonado

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 8,11-13,15-18 and 21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 8,11-13,15-18 and 21 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The rejection asset forth in Paper mailed on 06/17/2005 is withdrawn in view of Applicants arguments filed on 07/22/2005.
2. Claims 8, 11-13, 15-18 and 21 are pending in the Application.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugahara et al. (U.S. 5,989,998) in view of Chiang et al. (U.S. 5,817,572) and Misawa et al. (U.S. 6,150,725).

Sugahara et al. (Figs.3a-d) teach a method of depositing on a substrate (200) a plurality of layers (202-204), wherein one or more of the layers (202, 204) is a low dielectric constant oxidized organosilane layer comprising carbon, wherein the low dielectric constant oxidized organosilane layer is deposited in a plasma enhanced process from a mixture comprising an organosilane compound an oxidizing gas, wherein said organosilane compound is selected from a phenylsilane group or a vinylsilane group; and etching said one or more of said layers in a patterning process, wherein the carbon content of said oxidized organosilane layer is, for example, 25.7% (first embodiment, chemical formula 2) or 22.2% (ninth embodiment, chemical formula

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15) (column 7, line 66 – column 8, line 8, line 34, column 8, line 58 – column 11, line 53 and column 18, line 25 – column 21, line 53).

Sugahara et al. fail to expressly teach wherein said oxidized organosilane layer has a carbon content from 1% to 50%. However, in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. MPEP 2144.05. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dielectric layer with the carbon concentration disclosed in the teachings of Sugahara et al. to arrive at the claimed invention.

Sugahara et al. fail to expressly teach using a photoresist layer into said plurality of dielectric layers. However, Chiang et al. (Figs.1-6) teach a method of patterning a plurality of dielectric layers (22, 23), wherein said patterning can be performed using a photoresist as a mask (column 5, line 40 – column 6, line 65). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Sugahara et al. and Chiang et al. to enable using a photoresist layer as a mask in the patterning process of Sugahara et al. according to the teachings of Chiang et al. because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of performing said patterning step of Sugahara et al. and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

The combined teachings of Sugahara et al. and Chiang et al. fail to teach etching said oxidized organosilane layer using fluorine, carbon, and oxygen ions. However,

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Misawa et al. (Figs.5a-b) teach a method of etching dielectric layers including etching an oxidized organosilane layer (120) using fluorocarbon gases including CF_4 and C_2F_6 and oxygen gas (column 7, line 43 – column 8, line 9). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Sugahara et al. and Chiang et al. with Misawa et al. to enable the etching step of the combination of Sugahara et al. and Chiang et al. to be performed according to the teachings of Misawa et al. because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of performing the disclosed etching step of Sugahara et al. and Chiang et al. and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

5. Claims 11-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Havemann (U.S. 5,482,894) in view of Sugahara et al. (U.S. 5,989,998).

In reference to claim 11, Havemann (Figs.1A-I) teaches a method of forming a plurality of layers including the steps of forming a silicon oxide (30) layer on a substrate (20); forming an organic SOG layer (32) on said silicon oxide layer (30); and forming a photoresist layer (36) on said organic SOG layer (32) for the purpose of patterning said organic SOG layer (32) and said silicon oxide layer (30), wherein said organic SOG layer has 30-40% organic polymer by weight (column 3, line 54 – column 5, line 1).

Havemann fails to teach wherein said organic layer is deposited in a plasma-enhanced process from a mixture comprising organosilane compound and an oxidizing gas. However, Sugahara et al. (Figs.3a-d) teach a method of depositing on a substrate (200) a plurality of layers (202-204), wherein one or more of the layers (202, 204) is a

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low dielectric constant oxidized organosilane layer comprising carbon, wherein the low dielectric constant oxidized organosilane layer is deposited in a plasma enhanced process from a mixture comprising an organosilane compound an oxidizing gas, wherein said organosilane compound is selected from a phenylsilane group or a vinylsilane group; and etching said one or more of said layers in a patterning process, wherein the carbon content of said oxidized organosilane layer is, for example, 25.7% (first embodiment, chemical formula 2) or 22.2% (ninth embodiment, chemical formula 15) (column 7, line 66 – column 8, line 8, line 34, column 8, line 58 – column 11, line 53 and column 18, line 25 – column 21, line 53).

Still, the combined teachings of Havemann and Sugahara et al. fail to teach wherein the carbon content of the organic dielectric layer is from 1% to 50%. However, in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. MPEP 2144.05. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dielectric layer disclosed in the combined teachings of Havemann and Sugahara et al. to arrive at the claimed invention.

In reference to claim 12, the combined teachings of Havemann and Sugahara et al. teach wherein the low dielectric constant oxidized organosilane layer is between two dielectric layers in the plurality of layers.

In reference to claim 13, the combined teachings of Havemann and Sugahara et al. teach wherein the low dielectric constant organosilane layer is deposited in the presence of RF power and the organosilane compound includes the structure C-Si-H.

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6. Claims 15-18 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugahara et al. (U.S. 5,989,998) in view of Chiang et al. (U.S. 5,817,572) and Matsuura (U.S. 6,124,641).

In reference to claims 15 and 21, Sugahara et al. (Figs.3a-d) teach a method of depositing on a substrate (200) a plurality of layers (202-204), wherein one or more of the layers (202, 204) is a low dielectric constant oxidized organosilane layer comprising carbon, wherein the low dielectric constant oxidized organosilane layer is deposited in a plasma enhanced process from a mixture comprising an organosilane compound an oxidizing gas, wherein said organosilane compound is selected from a phenylsilane group or a vinylsilane group; and etching said one or more of said layers in a patterning process, wherein the carbon content of said oxidized organosilane layer is, for example, 25.7% (first embodiment, chemical formula 2) or 22.2% (ninth embodiment, chemical formula 15) (column 7, line 66 – column 8, line 8, line 34, column 8, line 58 – column 11, line 53 and column 18, line 25 – column 21, line 53).

Sugahara et al. fail to expressly teach wherein said oxidized organosilane layer has a carbon content from 1% to 50%. However, in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. MPEP 2144.05. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the dielectric layer with the carbon concentration disclosed in the teachings of Sugahara et al. to arrive at the claimed invention.

Sugahara et al. fail to expressly teach using a photoresist layer into said plurality of dielectric layers. However, Chiang et al. (Figs.1-6) teach a method of patterning a plurality of dielectric layers (22, 23), wherein said patterning can be performed using a photoresist as a mask (column 5, line 40 – column 6, line 65). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Sugahara et al. and Chiang et al. to enable using a photoresist layer as a mask in the patterning process of Sugahara et al. according to the teachings of Chiang et al. because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable methods of performing said patterning step of Sugahara et al. and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

The combined teachings of Sugahara et al. and Chiang et al. fail to teach wherein said organosilane compound is a methylsilane compound. However, Matsuura in a related method of reducing the dielectric constant silicon oxide layer teaches depositing an oxidized organosilane layer (organic silicon oxide) formed by reacting an organosilane compound such as methylsilane and vinylsilane with oxidizing agents and wherein said oxidizing agents include N_2O and H_2O_2 (column 2, line 57 – column 4, line 29). It would have been within the scope of one of ordinary skill in the art to combine the teachings of Sugahara et al., and Chiang et al. with Matsuura to enable forming in organic silicon oxide layer in Sugahara et al. and Chiang et al. to be performed according to the teachings of Matsuura because one of ordinary skill in the art at the time the invention was made would have been motivated to look to alternative suitable

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methods of forming the organic oxide layer of Sugahara et al. and Chiang et al. and art recognized suitability for an intended purpose has been recognized to be motivation to combine. MPEP 2144.07.

In reference to claims 16-18, the combined teachings of Sugahara et al., Chiang et al. and Matsuura teach wherein the plurality of layers further comprises an etch stop layer made of silicon nitride, and wherein said nitride layer is between an underlying and overlying oxidized organosilane layer.

Response to Arguments

7. Applicant's arguments with respect to claims 8, 11-13, 15-18 and 21 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Applicants are encouraged, where appropriate, to check Patent Application Information Retrieval (PAIR) (<http://portal.uspto.gov/external/portal/pair>) which provides applicants direct secure access to their own patent application status information, as well as to general patent information publicly available.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.

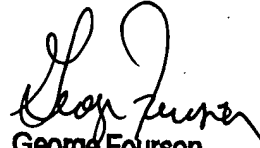
10. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax number for this group is 571-273-8300. Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.

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Julio J. Maldonado
Patent Examiner
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Julio J. Maldonado
July 26, 2005



George Fourson
Primary Examiner